IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Daniel J. Arriola, et al
Serial No.	:	10/589,377
Filing Date	:	August 14, 2006
For	:	Catalyst Composition Comprising Shuttling Agent for Ethylene Multi-Block Copolymer Formation
Group Art Unit	:	1796
Confirmation No.	:	7109
Examiner	:	Lenihan, Jeffrey S.
Attorney Docket No.	:	DOW-36271-D (63558D)

DECLARATION OF EDMUND M. CARNAHAN UNDER 37 C.F.R. §1.132

I, EDMUND M. CARNAHAN, the undersigned Declarant, do hereby state and declare that:

1. From 1996 to the present, I have been employed with The Dow Chemical Company. In my current position as a Fellow, I am the Scientific Leader for the Core Research and Development Catalyst Synthesis and Implementation Group. I received my B.A. in chemistry from Cornell University, New York, in 1987. I received my Ph.D. in inorganic chemistry from The Massachusetts Institute of Technology, Massachusetts, in 1991. I am one skilled in the art of the instant patent application.

2. I am intimately familiar with the above-referenced patent application (the '377 application). I am an inventor to the '377 patent application.

3. I have read the Examiner's Office Action dated December 16, 2009; U.S. Patent No. 5,391,629 to Turner et al. (*Turner*); U.S. Patent No. 5,733,980 to Cozewith et al. (*Cozewith980*); and U.S. Patent No. 5,798,420 to Cozewith et al. (*Cozewith420*) cited therein.

4. The block copolymer in each of *Turner*, *Cozewith980* and *Cozewith420* is produced in a similar way. Each of *Turner*, *Cozewith980* and *Cozewith420* produces block copolymer in a living polymerization system having a single catalyst and using sequential monomer addition. This ideally produces a block copolymer that is monodisperse, and any deviations from monodispersity are a result of premature termination of some chains. For each polymer molecule within the block copolymer of *Turner*, *Cozewith980* and *Cozewith420*, the block size for each respective block is the same. Also, each polymer molecule has the same number of blocks. The sole purpose of living olefin polymerization is to produce a very uniform polymer where each molecule has the same number of blocks, each block has the same composition and the same molecular weight. Any deviations from this monodispersity of molecular weight, composition, and block number are defects, and not desirable features of the living polymer system.

5. The multi-block copolymer disclosed and claimed in our invention is fundamentally different compared to the monodisperse block copolymers disclosed in *Turner*, *Cozewith980* and *Cozewith420*. The chain shuttling polymerization process used to make our polymer produces the unique structure and the unique physical properties embodied by our multi-block copolymer. Chain shuttling polymerization uses as least two catalysts. Each catalyst in our process forms polymer segments having most probable, not monodisperse, block length. These blocks are assembled by the chain shuttling agent into segmented multi-block copolymers with a distribution of block lengths and block sizes. The number and length of each block is determined in part by the concentration of the chain shuttling agent that is present during polymerization. This produces a multi-block copolymer with segmented blocks differing in comonomer content, crystallinity, density, melting point and/or glass transition temperature. Our multi-block copolymer also has (i) a polydisperse block number distribution and (ii) a polydisperse distribution of block sizes. The multi-block copolymer possesses a M_w/M_n fitting a Schultz-Flory distribution rather than a Poisson distribution. All these factors contribute to a multi-block copolymer with a unique structure and unique physical properties.

6. Our multi-block copolymer with a polydisperse block number distribution and a polydisperse distribution of block sizes is structurally and physically distinct compared to

the monodisperse block copolymer of *Turner*, *Cozewith980* and *Cozewith420* produced by way of a living polymerization system.

7. Our multi-block copolymer containing segmented blocks is structurally and physically distinct compared to the tapered copolymer disclosed in *Turner*, *Cozewith980* and *Cozewith420*. While *Cozewith980* and *Cozewith420* do not refer to the copolymer as tapered, the copolymer in each of *Cozewith980* and *Cozewith420* is tapered. The copolymer in *Cozewith980* and *Cozewith420* is tapered to at least the same degree as the tapered copolymer of *Turner* (hereafter collectively "*tapered copolymer*"). The composition of the *tapered copolymer* changes gradually from one end (head, rich in high-reactive monomer) to the other end (tail, rich in low-reactive monomer). The *tapered copolymer* thereby lacks segmented blocks.

8. In contrast to the *tapered copolymer*, the junctions between our segmented blocks are sharp and delineated. In other words, where one block ends and another block begins is well-defined or "segmented" in our multi-block copolymer. The segmented multi-blocks are the result of the chain shuttling polymerization. The composition of each segmented block is determined by the catalyst which makes it and the reactor composition. Since our reactor composition is constant and does not change during the life of the growing polymer, the block composition is determined only by the catalyst which makes the block. Thus, in our multi-block copolymer, no tapering exists between adjacent blocks. Rather, the block junctions are sharp, clear, well-defined, distinct, and delineated—that is, the blocks are segmented.

9. The multi-block copolymer disclosed and claimed in the '377 application is available commerically under the tradename INFUSE™ olefin block copolymer. The INFUSE™ olefin block copolymer won the prestigious R&D 100 Award in 2009. A copy of the R&D 100 Award is provided at Tab 1.

10. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18

of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this Rule 132 Declaration is directed.

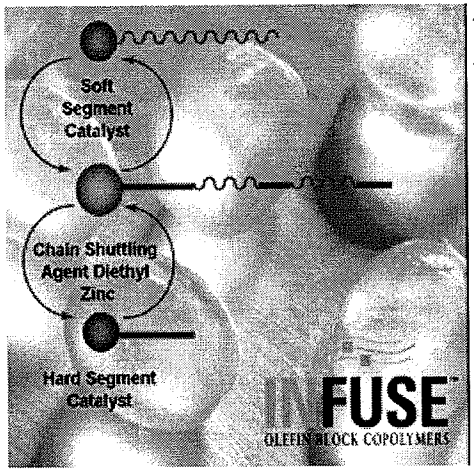
Dated: 15-April-2010

EDMUND M. CARNAHAN

Tab 1

Alternating blocks put polymers on performance path

Monday, July 27, 2009



A new catalytic block technology developed by The Dow Chemical Company, Freeport, Texas, has opened the door to a new type of block copolymers with predictable, controllable chains of various type of blocks. The **INFUSE Olefin Block Copolymers** (OBCs) feature chains with alternating blocks of "hard" (highly rigid) and "soft" (highly elastomeric) segments that are created and assembled via a patent pending shuttling process. Because the alternating block types provide highly differentiated material properties along the chain, the traditional relationship of flexibility and heat resistance in the polymer is disrupted to a beneficial effect. The materials, meanwhile, provide improved compression set and elastic recovery properties versus other polyolefin plastomers and elastomers. OBCs have both the flexibility of polyolefin plastomers and elastomers and the heat resistance of high density polyethylene.

INFUSE™ Olefin Block Copolymers Earn Prestigious R&D 100 Award

Midland, MI - September 15, 2009 Share this:

The Dow Chemical Company has recently earned the prestigious R&D 100 Award for INFUSE™ Olefin Block Copolymers (OBCs), a revolutionary block copolymer that delivers new-to-the-world to adhesives and foams.

"We are extremely pleased to receive the R&D 100 Award for INFUSE OBCs as it recognizes the breakthrough nature of this material and Dow's strategic commitment to provide high-value performance solutions to customers around the world," said Luis Cirihal, Dow Elastomers business director. "I'd like to thank the dedicated team of people behind the development of INFUSE OBCs, including a highly motivated group of customers whose collaboration continues to drive global success."

INFUSE OBCs provide breakthrough performance in two key areas: catalyst technology and material performance. In the first area, Dow developed a catalytic block technology and patent-pending shuttling process that uniquely controls the hard and soft segments of a polymer chain. This enables OBCs to be made - for the first time -- via a cost-effective continuous process, while providing outstanding design freedom. The resulting INFUSE OBCs offer highly differentiated material properties that break traditional relationships and create opportunity for customers. They offer, for example, the flexibility of polyolefin plastomers and elastomers along with the heat resistance of high density polyethylene - a combination previously not possible.

"INFUSE OBCs are already enabling customers to deliver new solutions to end users in a variety of markets and applications, including those that are currently served by high-performance thermoplastic elastomers," said Karen Fennessy-Ketola, global platform director. "Because they offer a blend of flexibility, heat resistance, elasticity, and durability - along with the processability of a polyolefin - INFUSE OBCs are quickly earning a name as a next-generation specialty material that defies the old and defines the new."

Tim Diephouse, research & development leader concurs. "The shuttling process developed by Dow provides an unheard level of design flexibility for OBCs that enables us to dial into the different performance and processing needs of customers, creating tailor-made OBCs for specific end-use applications. This opens an entirely new realm of possibilities for customers and Dow, and we're all excited about what the future holds."

For 47 years, the prestigious R&D 100 Awards have identified revolutionary technologies newly introduced to the market. Winners are selected by an independent judging panel and the editors of R&D Magazine.

For more information about INFUSE OBCs, see www.dow.com/infuse. For more about the awards, see www.rdmag.com.

About Dow

Dow is a diversified chemical company that combines the power of science and technology with the "Human Element" to constantly improve what is essential to human progress. The Company delivers a broad range of products and services to customers in approximately 160 countries, connecting chemistry and innovation with the principles of sustainability to help provide everything from fresh water, food and pharmaceuticals to paints, packaging and personal care products. In 2008, Dow had annual sales of $57.5 billion and employed approximately 46,000 people worldwide. The Company has 150 manufacturing sites in 35 countries and produces approximately 3,300 products. On April 1, 2009, Dow acquired Rohm and Haas Company, a global specialty materials company with sales of $10 billion in 2008, 98 manufacturing sites in 30 countries and approximately 15,000 employees worldwide. References to "Dow" or the "Company" mean The Dow Chemical Company and its consolidated subsidiaries unless otherwise expressly noted. More information about Dow can be found at www.dow.com.